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TITLE: Interdisciplinary Research Training in Breast Cancer

PRINCIPAL INVESTIGATOR: Ruth McCorkle, Ph.D., RN

CONTRACTING ORGANIZATION: Yale University
New Haven, Connecticut 06520-8047

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The purpose of this predoctoral and postdoctoral training program is to prepare clinical researchers who will impact the care of women with breast cancer or women who are at risk for breast cancer. The predoctoral program prepares the beginning researcher with the knowledge and skills necessary to develop and test clinical interventions. This program builds on the Yale School of Nursing's current doctoral program. Postdoctoral training prepares the investigator to conduct more complex studies which involve an interdisciplinary perspective or the need for sophisticated analytic techniques. The research training program in breast cancer began on July 1, 2000 and within the first year, the program directors have filled the two positions with outstanding trainees. Courses in the doctoral program at the Yale School of Nursing have been expanded to include breast cancer content. The postdoctoral program has been established. Faculty across disciplines are collaborating and future initiatives are planned. These activities will enhance our ability to contribute to the knowledge base related to the care of women with breast cancer or women at risk to develop breast cancer.

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INTRODUCTION

The purpose of this predoctoral and postdoctoral training program is to prepare clinical researchers who will impact the care of women with breast cancer or women who are at risk for breast cancer. The predoctoral program prepares the beginning researcher with the knowledge and skills necessary to develop and test clinical interventions. This program builds on the Yale School of Nursing's current doctoral program. Postdoctoral training prepares the investigator to conduct more complex studies which involve an interdisciplinary perspective or the need for sophisticated analytic techniques.

The research training program in breast cancer began on July 1, 2000. The two program directors, Drs. Ruth McCorkle and Michael Reiss, met several times during the first month of the program to review the statement of work and develop a plan to implement the program. The first task was to form an administrative team to oversee the recruitment of trainees and the implementation of the training program. In addition to Drs. McCorkle and Reiss, two additional researchers in breast cancer agreed to participate and meet monthly: Drs. Tish Knobf and Beth Jones. Dr. Knobf is an Associate Professor in the Yale School of Nursing and has developed a program of research related to chemotherapy induced menopause. Dr. Jones is an Associate Professor in the Yale School of Epidemiology and Public Health. Her research is related to factors associated with the incidence of breast cancer in black and white women.

BODY

Task 1: Completed. Potential applicants were identified.

Predoctoral Position: Seven doctoral students currently enrolled in Yale's School of Nursing's doctoral program expressed interest in the training program (Kanner, Lee, Chen, Potter, Ercolano, Soto, and Tang), and two completed the application and applied. Both applicants (Lee and Potter) proposed to study women with breast cancer. Although both candidates were equally strong, the administrative team selected Katie Lee because her proposed study is designed to focus on the decision making aspects of treatment choices for Asian women, a topic where little to no scientific literature exists. Ms. Lee is also a minority.

Postdoctoral Position: There were four inquiries about the postdoctoral position; two were not United States citizens and a third was interested in an area of study, immunology, in which we did not have a direct match with a faculty member with an established program of research. The fourth person, Dr. Donna Clemmens, was encouraged to apply and completed the application process including face to face interviews with members of the administrative team.

Task 2: Ongoing.

Substantive content related to breast cancer has been added to two core courses within the doctoral program: N913 Human Responses to Chronic Illness and N941 Linking Research and Health Policy. Dr. McCorkle has also offered an independent study on research related to the care of patients with cancer. She plans to present this course to the curriculum committee to formalize it as an elective to partially fulfill the cognate requirement.

Research experiences in breast cancer have been identified with the program faculty, including Drs. McCorkle, Knobf, Jones, Pasacreta, Bradley, and Kasl. Assignments are based on interest of the trainee and match with the mentor's program of research.

Task 3: Completed.

A postdoctoral program related to breast cancer was developed for doctorally prepared nurses or other professionals. Course work has been identified and research experiences have been established, including practicum and seminars.

Task 4: Completed.

A formalized program of recruitment has been established. By August 2000, the administrative team agreed on standardized criteria for selecting trainees and developed a form for potential pre and postdoctoral trainees to apply. The application form was posted on the School of Nursing, Center for Excellence in Chronic Illness Care web site and can be completed and submitted electronically. Dr. McCorkle also attended several meetings this past year and distributed announcements about the program. She met with potential applicants. (A copy of the announcement and application is in Appendix A).

Task 5: Ongoing.

A formalized system to select and monitor trainees has been implemented. The administrative team meets monthly to review the trainees' progress. Trainees are matched with research mentors based on their interests and mentors' program of research. Trainees meet weekly with their mentors and participate in their research activities while concurrently developing their own research proposals.

Task 6: Ongoing.

There have been a number of activities that the faculty and trainees have participated in that were previously established as a part of the Yale Cancer Center. These have included monthly grand rounds and monthly meetings of the Breast Cancer Group, under Dr. Michael Reiss' leadership. The trainees have also participated in monthly meetings of the pre and postdoctoral trainees in the School of Nursing. Although the focus of this latter group is not solely on breast cancer, all of the participants are studying vulnerable populations with other chronic diseases and their discussions related to methodological and analytical issues are relevant. As part of the training program, several nationally recognized researchers were asked to present their research at the Cancer Center Grand Rounds. These included: Dr. Leslie Degner, Professor, University of Manitoba. Her talk was entitled: Information Needs and Decisional Preferences in Women with Breast Cancer. Also, Dr. Ann Berger from the Clinical Center at NIH, spoke on the Need for Palliative Care in Tertiary Centers.

Task 7: Ongoing.

We have been successful in recruiting one predoctoral and one postdoctoral trainee. We are currently reviewing our applicants for year 02 and will make our final selection at our August administrative team meeting.

Predoctoral. As a second year full time doctoral student already admitted to the Yale's School of Nursing, Shui-yu (Katie) Lee was selected as the first pre-doctoral trainee. Dr. Tish Knobf is Ms. Lee's academic advisor and Dr. McCorkle is her research advisor. Ms. Lee also works closely with Drs. Michael Reiss and Jones. As part of her research practicum, Ms. Lee attends the medical oncology clinic at the Yale Cancer Center twice a week to review medical records to

verify that patients meet the eligibility requirements for recruitment to an intervention study to test the effects of symptom management and educational materials for patients who are currently receiving chemotherapy.

Key Accomplishments of Ms. Lee.

As part of the training program, Ms. Lee has completed the following courses:

Fall, 2000

N903 Measurement of Clinical Variables

N561 Health Policy for Public and Private Sectors

N719 Integrated Clinical/ Financial Information into Management

N904 Independent Study- Testing the psychometric properties of Chinese version of Control Preferences Scale on a sample of 67 Chinese healthy adults.

N904 Independent Study - Family and Cancer Treatment Decision- Making in Chinese

N907 Dissertation Seminar

Spring, 2001

CDE 532 Cancer Epidemiology (School of Public Health)

N925 Qualitative Research in Nursing

N919 Pro-seminar in Survey Research Methods

N941 Linking Research and Health Policy

MGT515 Decision Making and Game Theory (School of Management)

N907 Dissertation Seminar

Reportable Outcomes of Ms. Lee.

Publications

Lee, S. C., & Knafl, K. (in preparation). Family and cancer treatment decision making in Chinese.

Lee, S. C. (in preparation). Associations between treatment decision-making and outcomes of women with early-stage breast cancer: A review.

Lee, S. C., & Dixon, J. (in preparation). The psychometric testing of Chinese version of Control Preference Scale.

National Meetings and Networking

Feb., 9-10, 2001: Symposium, "Current Racial and Ethnic Disparities in Health," New Haven, CT. Sponsored by Yale Journal of Health Policy, Law And Ethics, Yale University

March 22, 2001: Symposium, "Forum on Asian Americans and Mental Health," New Haven, CT. Sponsored by AAIYM & Office of Multicultural Affairs.

April 1-2, 2001: 13th Annual Scientific Sessions of Eastern Nursing Research Society, "Research for a New American: Peoples, Technology and Healthcare," Atlanta City, NJ. Sponsored by Eastern Nursing Research Society

July 20-22, 2001 "The American Cancer Society Fourth Chinese Caucus Meeting," Atlanta, GA., Sponsored by American Cancer Society.

Dissertation Proposal

Ms. Lee has completed an initial draft of her dissertation proposal this past semester.

Title: Treatment Decision-Making and Quality of Life Among Chinese American Women with Early Stage Breast Cancer

Breast cancer is the most common cancer in females for all races in the US. The incidence of breast cancer in Asian Americans increased with 2.2 percent annually during 1990-1997. Although breast conserving treatment (BCT) is available, empirical data have shown that non-Caucasian women with early-stage breast cancer had lower utilization of BCS, as compared with their Caucasian counterpart. Whether this difference is a result of informed choice, clinical practice, different prognosis factors, or culture is still unknown.

This study will use a cross-sectional, retrospective design with mixed quantitative and qualitative methods to describe the treatment decision-making, the decision for the primary surgery, the satisfaction of the decision, the perceived outcome of treatment decision-making, and the quality of life after surgery among Chinese American women with early-stage breast cancer. Standardized instruments will measure the treatment decision-making as decisional conflict, expectations, value, and decision participation. The relationship among the treatment decision-making, the decision, the satisfaction, and the quality of life will be explored. A consecutive sample of 140 self-identified Chinese American women with early-stage breast cancer will be selected from six sites in New York. A semi-structured interview will be used with a purposive selected sub-sample of 20 women to understand how family members participate in the decision-making and how the women perceive the outcome of the decision-making. All instruments will be written in Chinese with appropriate equivalence after translation. All data will be collected by face-to-face interviews.

Postdoctoral. Dr. Donna (Danuta) Clemmens defended her dissertation at the University of Connecticut in September and started as a postdoctoral trainee on October 1, 2000. Dr. Clemmens has extensive experience and a solid background in adolescent health and is developing a research program related to the impact of crisis events on adolescent development. Throughout the year, Dr. Clemmens has worked closely with Dr. McCorkle as the Program Director and mentor in expanding her research to adolescent daughters' and women's experiences with breast cancer. Dr. Clemmens also attends the breast cancer clinic with Dr. Knobf on Wednesday mornings to talk with patients about their experiences.

Key Accomplishments of Dr. Clemmens.

As part of the training program, Dr. Clemmens has completed the following course:
N414: Advanced Qualitative Methods. 3 credits, spring term, 2001.

This course provided an in-depth grounding in advanced qualitative methods and involved the development of a research protocol using one of the methodologies. A meta-synthesis of qualitative studies of adolescent health was conducted and submitted for publication to *Maternal and Child Health Nursing* as part of the course requirements.

Reportable Outcomes of Dr. Clemmens.

Publications

Clemmens, D. (2001). The relationship between social support and adolescent mothers' interactions with their infants: A meta-analysis. *JOGNN*, 30 (4), 410-420. (See Appendix B).

Clemmens, D. (submitted). Adolescent mother's experiences of feeling depressed following the birth of their babies: Weathering the storm. *Adolescents*.

Clemmens, D. (submitted). Adolescent motherhood: A meta-synthesis of qualitative studies. *MCN*.

National Meetings and Networking

Dr. Clemmens attended the Sixth Annual Research Conference sponsored by the Oncology Nursing Society, Ponte Vedra, Florida, February, 2001. She met with internationally known breast cancer researchers, eg. Drs. Fran Lewis and Laura Northouse. She has also met with other professionals and groups that provide services related to breast cancer. These have included joining the Oncology Nursing Society (ONS); participating in cancer center grand rounds at the Yale Cancer Center, developing contacts with new (Center for Hope, Greenwich Hospital) and existing (Yale New Haven Hospital, Stamford Hospital, Norwalk Hospital) community groups and Cancer Centers.

Grant Proposals

Dr. Clemmens has developed one research proposal and submitted it for funding to the Oncology Nursing Foundation and is currently developing a second one. The first proposal has been submitted and approved by the Yale School of Nursing Human Subjects Research Review Committee; it has also been submitted to the DOD committee and approval is pending. Data collection will not begin until final approval is obtained. The study will include only women; and women of all racial groups will be recruited.

Title: Adolescent Daughters' Experiences of Living with and Communicating about Their Mothers' Diagnosis of Breast Cancer, submitted to the Oncology Nursing Foundation.

The purpose of the study is to increase the understanding of adolescent daughters' experiences with a maternal diagnosis of breast cancer. The aim of this study is to describe the experiences of adolescent daughters from their perspective, in living with and communicating about their mothers' diagnosis of breast cancer. The potential burden of living with mothers' breast cancer diagnoses and treatments, with their potential loss, and with assuming some of the caregiver responsibilities of the family, presents adolescent daughters with stressful and potentially devastating life experiences. Yet few studies address the impact of parental cancer on adolescent daughters. Researchers have also identified the difficulty women experience in communicating about the disease with their children. Given the additional stress of potentially developing the disease, the experiences of adolescent daughters' lives need to be addressed. The lack of data regarding the experience of living with and communicating about the maternal disease from the perspective of the adolescent daughter provides validation for a phenomenological study.

Van Manen's interpretive, phenomenological design will guide the data collection and analysis and combines both a descriptive and interpretive method. Interpretation takes place in the context of the everyday experiences of the researcher and participants and enables a more in depth understanding of a specific phenomenon. Recruitment will involve a variety of settings throughout Connecticut, including Cancer Center clinics, and community agencies. The sample for this study will be purposive, and include approximately 20 English-speaking participants at 3 developmental stages, between 13 to 18 years of age. The primary question to be answered by this study: What is the essential structure of adolescent daughters' experiences in living with and communicating about their mothers' breast cancer?

An in-depth, semi-structured interview will be audiotaped in response to the following statement: "What it is like to live with and talk about your mother's breast cancer." Participants will also be asked to reflect upon a piece of music, art, literature or journal entry that portrays their experience. Data collection will continue until data saturation is achieved. Major themes describing the phenomenon will be identified from the data. The findings can increase nurses'

understanding of how this highly stressful phase in a woman's illness trajectory affects adolescent daughters at different ages and stages, and potentially lead to interventions that will help adolescent daughters and mothers cope with the experience of breast.

KEY ACCOMPLISHMENTS OF THE PROGRAM

The following activities were accomplished in the first year:

1. Established a core administrative team to oversee the work of the training program.
2. Established criteria for selecting trainees, including the design of the application form .
3. Developed and implemented a process for selecting trainees and monitoring their progress.
4. Expanded existing core courses within the School of Nursing doctoral program to include content related to breast cancer research.
5. Established a long term plan for recruiting applicants, including minorities.
6. Established a postdoctoral training program within the School of Nursing.
7. Established mechanisms for collaboration among program faculty.
8. Identified opportunities for funding research grants of trainees and facilitated submission of proposals to agencies and foundations.

REPORTABLE OUTCOMES OF THE PROGRAM

The following outcomes were achieved:

1. Filled our one predoctoral and one postdoctoral positions with competitive and qualified trainees.
2. Recruited Dr. Michael DiGiovanna as the co-director of the research training program to replace Dr. Michael Reiss who left Yale School of Medicine in April, 2001. His biosketch is attached.
3. Presented research findings related to breast cancer research to potential donors of the American Cancer Society, New England Division in April, 2001 for potential funding, Drs. McCorkle, Knopf, and Jones presented.
4. Completed the Connecticut Cancer Plan and submitted it to the State of Connecticut, Department of Health for approval. Dr. McCorkle served as co-chaired of the Connecticut Cancer Coalition to develop the plan. The plan was developed in collaboration with the Yale Cancer Center, the University of Connecticut, the State Department of Health, and the Connecticut Medical Society. Breast cancer was included as one of the three cancer sites that the state has identified to reduce the burden of cancer in the state. Several initiatives will be developed in the coming months to implement the plan.

CONCLUSIONS

Within the first year of the research training program in breast cancer, the program directors have filled their two positions with outstanding trainees. Courses in the doctoral program at the Yale School of Nursing have been expanded to include breast cancer content. The postdoctoral program has been established. Faculty across disciplines are collaborating and future initiatives are planned. These activities will enhance our ability to contribute to the knowledge base related to the care of women with breast cancer or women at risk to develop breast cancer.

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel listed on the budget page for the initial budget period.			
NAME Michael Paul DiGiovanna, MD, PhD	POSITION TITLE Assistant Professor of Medicine and Pharmacology		
EDUCATION/TRAINING (Begin with baccalaureate or other professional education, such as nursing, and include post-doctoral training)			
INSTITUTION AND LOCATION	DEGREE (IF APPLICABLE)	YEAR(S)	FIELD OF STUDY
Cornell University, Ithaca, NY	BA	1984	Biochemistry, Music
Yale University, New Haven, CT	MD, PhD	1990	Medicine, Pharmacology
Yale-New Haven Hospital, New Haven, CT	Residency	1991-1994	Internal Medicine
Yale University, New Haven, CT	PostDoc Fellow	1993-1997	Pathology
Yale University, New Haven, CT	Oncology Fellow	1995-1997	Medical Oncology

RESEARCH AND PROFESSIONAL EXPERIENCE: Concluding with present position, list, in chronological order, previous employment, experience, and honors. Include present membership on any Federal Government public advisory committee. List, in chronological order, the titles, all authors, and complete references to all publication during the past 3 years and to representative earlier publications pertinent to this application. If the list of publications in the last 3 years exceeds 2 pages, select the most pertinent publications. PAGE LIMITATIONS APPLY. DO NOT EXCEED 3 PAGES FOR THE ENTIRE BIOGRAPHICAL SKETCH PER INVESTIGATOR.

PROFESSIONAL EXPERIENCE

1981, 1982, 1983 (Summers), Undergraduate Research, The Rockefeller University, Laboratory of Medical Biochemistry

1984 Undergraduate Research, Cornell University, College of Veterinary Medicine

9/84-12/90 Doctoral Research, Yale University School of Medicine, Department of Pharmacology

1/91-12/94 Internship and Residency in Internal Medicine, Yale-New Haven Hospital

1/93-6/97 Postdoctoral Fellow, Yale University School of Medicine, Department of Pathology

1/95-6/97 Fellow in Medical Oncology, Yale University School of Medicine

7/97- Assistant Professor of Medicine (Oncology), Yale University School of Medicine

7/97- Attending Physician, Section of Medical Oncology, Yale University School of Medicine

7/98- Assistant Professor of Pharmacology, Yale University School of Medicine

12/00- Co-Director, Yale Cancer Center, Breast Cancer Research Program

HONORS AND AWARDS

Hellman Medical Research Award, Yale University, 1999

US Army Medical Research and Materiel Command Career Development Award, 1997

Diplomat in Medical Oncology, American Board of Internal Medicine (Board Certified 1997)

American Association for Cancer Research, Hoffman La-Roche Travel Award, 1996

State of Connecticut, Critical Technology Program, "Windows of Opportunity" Grant Award, 1995

US Army Medical Research and Development Command, Postdoctoral Fellowship Award, 1994

Mathers Foundation/Yale Critical Technologies Program Grant Award, 1994

Diplomat, American Board of Internal Medicine (Board Certified 1994)

Alpha Lamda Delta Honor Society, Cornell University

Distinction in All Subjects, Cornell University

Phi Beta Kappa, Cornell University

PERTINENT PUBLICATIONS PAST THREE YEARS

1. **DiGiovanna, M.P.**, "Phosphorylation Sensitivity of the Commonly Used Anti-p185^{neo/erbB2} Monoclonal Antibody Clone 3B5 Suggests Selective Usage of Autophosphorylation Sites," *Analytical Biochemistry*, 247:167-170, 1997.
2. **DiGiovanna, M.P.**, Lerman, M.A., Coffey, R., Cardiff, R., Muller, W., and Stern, D.F., "Active signaling by Neu in transgenic mice," *Oncogene*, 17:1877-1884, 1998.
3. **DiGiovanna, M.P.**, "Clinical Significance of HER-2/*neu* Overexpression: Part I," In *Principles and Practice of Oncology Updates*, S.A. Rosenberg, editor, Lippincott Williams & Wilkins, Cedar Knolls, Vol. 13, No. 9, 1999.
4. **DiGiovanna, M.P.**, "Clinical Significance of HER-2/*neu* Overexpression: Part II," In *Principles and Practice of Oncology Updates*, S.A. Rosenberg, editor, Lippincott Williams & Wilkins, Cedar Knolls, Vol. 13, No. 10, 1999.
5. Thor, A.D., Liu, S., Edgerton, S., Moore, D. II, Kasowitz, K.M., Benz, C.C., Stern, D.F., and **DiGiovanna, M.P.**, "Activation (tyrosine phosphorylation) or ErbB-2 (HER-2/*neu*): A study of incidence and correlation with outcome in breast cancer," *Journal of Clinical Oncology*, 18:3230-3239, 2000.
6. Claus, E.B., Chu, P., Howe, C.L., Davison, T.L. Stern, D.F., Carter, D. and **DiGiovanna, M.P.**, "Pathobiologic findings in DCIS of the breast: Morphologic features, angiogenesis, HER-2/*neu* and hormone receptors," *Experimental and Molecular Pathology*, (in press).
7. Smith, B.D., Smith, G.L., Carter, D., **DiGiovanna, M.P.**, Kasowitz, K.M., Sasaki, C.T., and Haffty, B.G., "Molecular marker expression in oral and oropharyngeal squamous cell carcinoma," *Archives of Otolaryngology*, (in press).
8. **DiGiovanna, M.P.**, "Extracting functional information from tissues," *Molecular Diagnosis*, (in press).

PERTINENT EARLIER PUBLICATIONS

9. **DiGiovanna, M.P.**, "Myeloid Differentiation Associated Tyrosine Protein Kinase Activity," Doctoral Thesis, Yale University, 1990.
10. Gamba-Vitalo, C., **DiGiovanna, M.P.** and Sartorelli, A.C., "Effects of Recombinant Murine Granulocyte-Macrophage Colony-Stimulating Factor in Cyclophosphamide-Treated Mice," *Blood Cells*, 17:193-205, 1991.
11. **DiGiovanna, M.P.** and Sartorelli, A.C., "Myeloid Differentiation Associated Tyrosine Protein Kinase Activity in WEHI-3B Murine Monomyelocytic Leukemia Cells," *Leukemia*, 5:869-878, 1991.
12. Keyes, S.R., Loomis, R., **DiGiovanna, M.P.**, Pritsos, C.A., Rockwell, S. and Sartorelli, A.C., "Cytotoxicity and DNA Crosslinks Produced by Mitomycin Analogs in Aerobic and Hypoxic EMT6 Cells," *Cancer Communications*, 3:351-356, 1991.
13. **DiGiovanna, M.P.** and Sartorelli, A.C., "Differentiation Stage Specificity of Tyrosine Phosphorylation in Response to Granulocyte Macrophage Colony Stimulating Factor (GM-CSF)," *Cancer Letters*, 63:15-22, 1992.
14. **DiGiovanna, M.P.** and Stern, D.F., "Activation State-specific Monoclonal Antibody Detects Tyrosine Phosphorylated p85^{neu/erbB-2} in a Subset of Human Breast Tumors Overexpressing This Receptor," *Cancer Research*, 55:1946-1955, 1995.
15. **DiGiovanna, M.P.**, Roussel, R.R. and Stern, D.F., "Production of Antibodies That Recognize Specific Tyrosine-Phosphorylated Peptides," In *Current Protocols in Molecular Biology*, F. Ausubel, R. Brent, B. Kingston, D. Moore, J., Seidman, J.A. Smith and K. Struhl, eds., pp. 18.6.1-18.6.19, John Wiley and Sons, Inc., New York, 1996.
16. **DiGiovanna, M.P.**, Carter, D., Flynn, S.D. and Stern, D.F., "Functional Assay for HER-2/*neu* Demonstrates Active Signaling in a Minority of HER-2/*neu* Overexpressing Invasive Human Breast Tumors," *British Journal of Cancer*, 74:802-806, 1996.



YALE UNIVERSITY SCHOOL OF NURSING
Center for Excellence in Chronic Illness Care

PRE- AND POST-DOCTORAL FELLOWSHIP OPPORTUNITIES

The Yale University School of Nursing is seeking applicants for a pre- and post-doctoral research training program that emphasizes not only women with or at risk for breast cancer, but will explore the impact of breast cancer on the family and community.

The training program is funded by the Department of Defense's Breast Cancer Research Program and is designed to provide opportunities for pre-doctoral students and post-doctoral trainees to design and conduct research on the care of women with breast cancer or at risk for breast cancer with an emphasis on (a) individual and caregiver responses and outcomes in the biopsychosocial domains, and (b) the testing of nursing interventions to improve clinical outcomes. Trainees will receive intensive mentoring to facilitate their development as independent researchers.

The program is designed to provide the research fellow with:

1. the theoretical knowledge necessary for developing a program of research in the care of women with breast cancer or at risk for breast cancer in the context of their family and community environments.
2. the methodological skills to support the development of a research career in breast cancer; and
3. the experience in interdisciplinary team research.

Over

The objectives are achieved through coursework, participation in weekly research seminars, participation in faculty sponsored and independent research, and active involvement in regional, national, and international research conferences and symposia. Instruction, guidance, and mentoring in the area of grantsmanship and dissemination of research via presentations and publications are an integral part of the training. The training program draws upon the strengths of the faculty at Yale University School of Nursing and experts in medicine, physiology, psychiatry, psychology, epidemiology, and public health at the Yale Cancer Center.

Qualified applicants for pre-doctoral fellowships will be registered nurses holding a master's degree in nursing and admitted to the doctoral program at Yale University School of Nursing. Qualified applicants for post-doctoral fellowships will be registered nurses holding a master's degree in nursing and a doctoral degree in nursing or a related field who have particular interest, experience or training in cancer nursing research or research focusing on women at risk for breast cancer or who develop breast cancer and factors related to them. At the completion of the training program, the fellow will:

- design and conduct research related to the care of women with breast cancer or at risk for breast cancer,
- disseminate research findings to nursing and interdisciplinary audiences; and
- contribute to the knowledge base for the management of women with breast cancer or at risk for breast cancer.

For information contact:

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Director, Center for Excellence in Chronic Illness Care
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YALE UNIVERSITY SCHOOL OF NURSING
Center for Excellence in Chronic Illness Care

APPLICATION

Research Training Program in Breast Cancer

Name: _____

Date: _____

Address: _____

Telephone: _____

E-mail: _____

Present Position: _____

Check appropriate level: _____

_____ pre-doctoral fellowship

_____ post-doctoral fellowship

List clinical and community experiences related to breast cancer.

List presentations related to breast cancer.

Over

List research related to breast cancer (include funding).

List publications related to breast cancer (attach copy).

List your overall objectives to be achieved if accepted into the program.

List potential mentors you would like to work with.

Provide a one to two page abstract of your research interests related to breast cancer.

Include at least one reference from someone who can judge your ability to make a contribution to clinical research related to breast cancer.

Include a current curriculum vitae.

For additional information, please contact:

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2001 - 2002 Academic Year
Pre-Doctoral Deadline - April 16, 2001
Post-Doctoral Deadline - May 30, 2001

The Relationship Between Social Support and Adolescent Mothers' Interactions With Their Infants: A Meta-Analysis

Donna Clemmens, RN, PhD

Objective: The purpose of this meta-analysis was to statistically summarize the results of independent quantitative studies regarding the relationship between social support and adolescent mothers' interactions with their infants.

Data Sources: The following sources were selected from 1980 to 1999: citations from bibliographies of previously located articles, dissertations abstracts, the Social Sciences Citation Indexes, and researchers at a regional conference; online sources used were CINAHL, MEDLINE, ERIC, Psych Lit, and Social Work Abstracts.

Study Selection: Of a potential sample of 31 studies, 14 were excluded because they did not meet the sampling criteria, and 4 were deleted as outliers. The final sample consisted of 13 studies.

Data Extraction: Each study was coded for methodologic and substantive variables, including quality indicators.

Data Synthesis: Most of the studies were cross sectional in design and used a variety of measures. Together, the studies included a sample of 823 mothers.

Conclusions: A medium effect size and a significant relationship between social support of adolescent mothers and their interactions with their infants were established. No difference was found in the relationship when support was provided by the family or through a network. *JOGNN*, 30, 410-420; 2001.

Keywords: Adolescent mothers—Meta-analysis—Social support

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Concern for the welfare of adolescent mothers and their children over the past quarter of a century has resulted in a plethora of research (Barratt, Roach, Morgan, & Colbert, 1996; Black & Teti, 1997; Furstenberg, 1991; Koniak-Griffin, Verzemnieks, & Cahill, 1992; MacFarlane, 1997; Moore, Manlove, Gleib, & Morrison, 1998; Ventura, Curtin, & Mathews, 1998). Researchers of adolescent mothers and their children have focused on negative outcomes (Deal & Holt, 1998; Diehl, 1997; Hubbs-Tait et al., 1996; Leadbeater, Bishop, & Raver, 1996; Roth, Hendrickson, Schilling, & Stowell, 1998) as well as interventions to facilitate a better future for this population (Censullo, 1994; Field, Grizzle, Scafidi, & Schanberg, 1996; Hans, Bernstein, & Percansky, 1991; Koniak-Griffin, Mathenge, Anderson, & Verzemnieks, 1999; Seitz & Apfel, 1994). The concept of social support has been identified as a potential factor in the adjustment of adolescent women to parenthood, in their behavior and relationships with their children, and, ultimately, in the children's development and knowledge of themselves and the world (Barrera, 1981; Herrmann, Van Cleve, & Levisen, 1998; Levitt, Weber, & Clark, 1986; Nath, Borkowski, Whitman, & Schellenbach, 1991; Perrin & McDermott, 1997; Rhodes, Contreras, & Mangelsdorf, 1994; Royce & Balk, 1996; Secco & Mofatt, 1994). The extent to which social support is related to an improved maternal-infant relationship has varied across studies and populations. The purpose of the current meta-analysis is to provide a quantitative synthesis of the research addressing this relationship.

The maternal-infant relationship is reflected in the interactive behaviors of both mother and infant, comprising a critical measure of parenting (Hans et al., 1991). Consistency in parental behavior provides infants with a sense of trust, enhancing their development and social competence (Barnard et al., 1989; Shapiro & Mangelsdorf, 1994). Infants who do not form a trusting relationship with a caregiver have been described as exhibiting more problematic behaviors and doing poorly on developmental achievement tests (Field, Widmayer, Adler, & De Cubas, 1990). Within this group of infants who are at risk are the children of adolescent mothers.

Researchers of adolescent parenting have described adolescent mothers as interacting with less responsive and sensitive behavior, using fewer vocalizations, and providing a less stimulating environment than adult mothers (Barratt & Roach, 1995; Diehl, 1997). Developmental theorists have hypothesized that this is due largely to the adolescent's own developmental phase and needs (Young, 1988) as she struggles to meet the physical and emotional needs of her infant. Clinicians and researchers have proposed that by providing social support to the adolescent mother, she will become more responsive and sensitive in her interactions with her infant, positively affecting the infant's growth and development.

A review of social support theories and research carried out with adolescent mothers identified inconsistent descriptions and measures of the construct (Hupcey, 1998; Secco & Moffatt, 1994). Although several researchers reported a positive relationship between maternal responsiveness and social support (Bloom, 1998; Crockenberg, 1987; Ruff, 1987; Schilmoeller, Baranowski, & Higgins, 1991; Spieker & Bensley, 1994), the type, frequency, and sources of support varied across studies (Burke & Liston, 1994; Colletta, 1981; Dormire, Strauss, & Clarke, 1989; Luster, Perlstadt, McKinney, Sims, & Juang, 1996; Parsons & Pierce, 1998; Penny, Watson, Saunders, & Womble, 1993; Reis & Herz, 1987; Unger & Wandersman, 1985; Voight, Hans, & Bernstein, 1996). Unger and Wandersman (1985) reported two separate studies. In other studies (Jensen, 1997; O'Connor, 1994), support received within conflicted relationships negatively affected maternal-infant interaction. Secco and Moffatt (1994) noted that the majority of studies assessing social support and adolescent parenting are cross sectional, making inferences about the strength of the relationship between social support and maternal interactions difficult. Additionally, the variation in the 28 instruments available to measure social support leaves questions regarding the relationship of social support with other variables.

Maternal-infant interaction studies focus on the relationship between mother and infant. Flagler (1988) noted

that maternal role attainment may be best measured by the behavioral components of an adolescent mother's interactions with her infant. Adolescent mothers do not typically exhibit the variety or frequency of interactions with their newborns that adult mothers do (Ruff, 1987). However, as maternal age and time of observations increase, so does the behavioral responsiveness of the mother. Although age is an important correlate of maternal behavior, most researchers of adolescent maternal behavior provide an average age of subjects or lump together the age ranges with adults (Crnic & Greenberg, 1987; Crnic, Greenberg, Ragozin, Robinson, & Basham, 1983; Crockenberg, 1981; Levitt et al., 1986; Parsons & Pierce, 1998; Spieker & Bensley, 1994; vonWindeguth & Urbano, 1989). The measurement of maternal-infant interaction, although more consistent in instruments in which both maternal and infant behaviors are observed, either focuses on isolated behavior categories or on more abstract theoretical constructs. Studies that include differing measures of maternal interaction within differing age groupings are difficult to compare.

Because of varying definitions and measures, establishing the extent of the relationship between social support and maternal-infant interactions was difficult.

The difficulty in establishing the degree to which social support, with its varying definitions and measures, affects a mother's interactions with her infant, which also are measured differently, makes the overall conclusions about these two constructs confusing. A meta-analysis synthesizing the results of the various quantitative studies will provide a better understanding of this relationship. For the purpose of this meta-analysis, social support is conceptualized as a multidimensional construct, which encompasses a variety of sources and types of support and includes individuals' perceptions of satisfaction with the support received. Social support is operationally defined through a variety of measures. The maternal-infant relationship is conceptualized as a complex and dynamic process of relating between a mother and her infant. The mother-infant relationship is operationalized through maternal-infant interaction, and maternal behaviors are used as a measure of this relationship.

The research questions for this meta-analytic study were (a) What is the magnitude of the relationship

between social support of adolescent mothers and their interactions with their infants through age 1? and (b) To what extent are effect sizes correlated with the following predictor variables: publication date and source, sample size, research design, social support measure, maternal-infant interaction measure, the time frame for the measures, the quality score, and age of the subjects.

Method

Meta-analysis provides a single set of numbers that statistically summarizes the results of independent pieces of research (Mullen, 1989). In a meta-analysis, differing measurement and statistical techniques are combined to integrate findings from individual studies into a common unit called an effect size. The effect size provides a measure of the magnitude of the experimental effect on outcome variables (Beck, 1995). Meta-analysis should be considered when conflicting findings exist regarding the effects of interventions, when questions remain regarding a treatment or intervention, or when controversy exists about the need for further research on an intervention (Moody, 1990). The findings regarding the relationship between social support and maternal interaction behaviors in adolescent mothers vary significantly across studies; thus, questions remain as to the strength of this relationship.

Several methodologic options are available for conducting a meta-analysis (Greener & Grimshaw, 1996; Oxman, 1994; Sutton, Jones, Abrams, Sheldon, & Song, 1999). Mullen's (1989) methodology, commonly used in the social sciences, and his basic data management system were used to conduct the current meta-analysis. Mullen emphasized adherence to the following steps to carry out a meta-analysis that is precise, objective, and replicable: (a) defining the hypothesis test with precision, including the dependent variable, the independent variable, the sampling and procedure, and the statistical tests to be used; (b) identifying, locating, and procuring studies to be included in the meta-analysis; (c) retrieving the appropriate statistics from these studies and transforming and expressing the statistics in common metrics as needed; (d) retrieving the predictors that may explain the variability in study outcomes; and (e) interpreting the analysis, focusing on central tendency, variability, and prediction. For the current meta-analysis, the null hypothesis was that no relationship exists between social support and adolescent mothers' interactions with their infants.

Sample

The sample inclusion criteria used to select the studies for this meta-analysis were the following: (a) the study involved adolescent mothers under age 20, (b) the study focused on the relationship between social sup-

port and maternal-infant interaction, (c) the observations of maternal interaction occurred within the infant's 1st year of life, (d) statistical measures were identified for the relationship between social support and maternal interactions, and (e) the study was published or reported between 1980 and 1999. A degree of freedom equal to 1 was a requirement in studies where an *F* or chi-square statistic was used to analyze the outcome measure (Mullen, 1989).

To retrieve the studies for this meta-analysis, Cooper's (1989) five approaches were used to obtain a full range of sources and produce a more accurate meta-analysis:

- Citations from bibliographies of previously located articles were used.
- Abstracting services were used to access dissertation abstracts, psychologic abstracts, and sociologic abstracts.
- The Social Science Citation Indexes were used to retrieve studies cited in earlier key studies. This reflected the descendancy approach.
- Two references to papers presented but not published were obtained from researchers at a conference to protect the meta-analysis from publication bias.
- An online computer search was used, yielding the largest number of studies. The Cumulative Index to Nursing and Allied Health Literature, MEDLINE, Psych Info, and Social Work Abstracts were searched for the years 1980 through 1999, using the keywords *social support*, *adolescent mothers*, and *maternal-infant interactions*.

The potential sample consisted of 31 studies. In the initial review of the studies, 14 were excluded because the samples included both adolescent and adult mothers, with the findings pooled together; infant ages, although averaging under 1 year, included measures after that time period; statistical data reporting the relationship between social support and maternal interaction were missing; and degrees of freedom were greater than 1.

Homogeneity tests were performed to identify outlier studies. An assumption for meta-analysis is that each study provides sample estimates of the effect sizes that are homogeneous or representative of the population effect size (Wolf, 1986). For example, if a group of studies provides a homogenous estimate, these different studies are likely testing the same hypothesis. On the other hand, when estimates are significantly heterogeneous, it is inappropriate to combine all the studies in one meta-analysis. Outliers were identified by their extreme *r* values during the initial analysis and removed one at a time until a nonsignificant homogeneity statistic was reached. Four studies (see Table 1) were deleted for a final sample of 13 studies.

TABLE 1
Studies Identified and Excluded as Outliers Through Homogeneity Testing

Study	Statistic	df	N	DOE	r	r ²	d	Quality
1. Spieker & Bensley (1994)	$r = .93$	1	197	+	.93	.86	5.02	27
2. Ruff (1987)	$r = .90$	1	100	+	.90	.80	4.03	20
3. Levine, Garcia Coll, & Oh(1985)	$r = .90$	1	15	+	.90	.813	4.17	19
4. O'Connor (1994)	$r = .08$	1	376	+	.08	.006	0.161	28

Note. DOE = direction of effect.

Procedure

Methodologic and substantive variables were extracted and coded from each of the studies. The methodologic variables were those factors that might have influenced the results of the studies included in the meta-analysis. Examples of these included the type of publication, country, sampling method, sample size, research design, data collection and time frame, statistics, and instruments used to measure social support and maternal-infant interaction. The substantive variables were those identified in previous research as influencing adolescent mothers' outcomes. These included the mother's age, living accommodations, marital status, ethnicity, education, socioeconomic status, the maternal behaviors measured, and the type or source of social support identified.

The investigator developed a scoring scheme to assess the quality of the studies chosen and address the potential bias within studies (Mullen, 1989). The scoring scheme consisted of 13 criteria, with higher scores applied to studies in which the first author had published multiple studies; funding was received; sampling was matched or random and sample sizes were larger; the constructs of social support and maternal-infant interaction were conceptually and operationally defined; instrument reliability and validity for the constructs of social support and maternal-infant interaction were identified; social support measures involved an interview, and maternal-infant interaction measurements included a videotape with a scoring tool and interrater reliability; the research design was experimental; trained data collectors were used; and multivariate statistics were used to analyze data. The highest possible score was 36.

The investigator and a nurse researcher independently evaluated the quality of the studies using the 13 criteria. The scores ranged from 19 to 28. This lower range of scores out of a possible high of 36 reflects the lower scores given for the largely cross-sectional research designs used and the limited conceptualizations and definitions of social support provided in the

studies. Interrater agreements ranged from 95% to 100%. In discussing the rationales for the evaluations, a consensus was reached on the quality score for each study.

Pearson product-moment correlation coefficient was the most common statistic or effect size used and was chosen for the meta-analysis. All of the coded variables were entered into the BASIC meta-analytic database. Each study's variables and statistics represented a separate hypothesis test.

Results

Sample

Characteristics. Seven of the 14 studies were published during the 1980s, with the remainder published during the 1990s. Nine of the studies had received funding, and all of the studies were conducted in the United States. All but one of the studies used a cross-sectional design, consistent with that reported in the literature. Twelve of the 14 studies used convenience samples. Eight of the 13 articles were published in journals, 1 was published in a book, 2 were dissertations, and 2 were papers presented at conferences. Individual study samples ranged from 18 to 177, for a total sample of 821 mothers for the purpose of this meta-analysis. In most of the studies, a range or averaging of demographic data was given. The overall average age of the studies' participants was 17 years.

Size. Unknown, unpublished studies may exist whose findings may fail to support the pattern reflected by the published results. This file drawer problem (Rosenthal, 1979) can distort the findings of a meta-analysis when all the studies are retrieved from published sources. Thus, a publication bias can be created in favor of significant results. Rosenthal developed a method to estimate the magnitude of the file drawer problem by calculating a failsafe number (Rosenthal,

1991; Rosenthal & Hall, 1981). This number is the minimum number of unpublished studies with non-significant findings that would be needed to change the conclusion of the meta-analysis. The failsafe number calculated for the current meta-analysis was 278 unpublished studies. This number exceeds the 75 unpublished studies that would need to be retrieved to overturn the conclusions of the current meta-analysis.

Homogeneity. The homogeneity test conducted on the 17 hypothesis tests was significant, indicating that the sample estimates of effect sizes were not representative of the population effect size. Four outliers were then identified (Levine, Garcia Coll, & Oh, 1985; O'Connor, 1994; Ruff, 1987; Spieker & Bensley, 1994). After these studies were deleted, the homogeneity tests for significance levels ($\chi^2 = 6.33, p = .90$) and for effect sizes ($\chi^2 = 5.22, p = .95$) were nonsignificant.

Measures

Retrieving statistics derived from multiple measures of social support and maternal interaction, found within a single study, involved collapsing them into a single hypothesis test. For example, when social support was measured both by type and frequency of support provided, a mean was calculated for these two measures. The result was one statistic being extracted for one hypothesis test per study. This was done to negate the potential nonindependence that can result from using multiple hypotheses tests based on multiple measures derived from a single study (Strube & Hartman, 1983).

Social Support. Three studies used no formal instrument to measure social support (Crockenberg, 1987; Unger & Wandersman, 1985). These studies included questions that tapped the type, source, or satisfaction with support received. Two studies used a combination of instruments, including the Community Interaction Checklist (Wahler, 1980), the Perceived Family Support Scale (Schilmoeller et al., 1991), the Social Network Map (Tracy, 1990), the Social Provisions Scale (Cutrona & Russell, 1987), and the Interpersonal Relations Inventory (Tilden, Nelson, & May, 1990). Eight instruments were used only once: the Stress, Support and Family Functioning Interview (Colletta, 1981); the Measurement of Interpersonal Trust for Use with Adolescents (Hestenes, 1997); the Arizona Social Support Interview Schedule (Barrera, 1981); the Social Support Questionnaire (Luster et al., 1996); the Self-Report Social Network Scale (Wilcox, 1981); the Father of Baby Support Scale (Bloom, 1998); the Family and Friend Apgar (Smilkstein, 1978); and the Norbeck Social Support Questionnaire (Norbeck, Lindsey, & Carrieri, 1981). Seven of the instruments used had no reports of reliability or validity.

Maternal Interaction. The Home Observation for Measurement of the Environment (HOME) (Caldwell & Bradley, 1979) was the most common instrument, with use in five studies (Luster et al., 1996; Reis & Herz, 1987; Schilmoeller et al., 1991; Unger & Wandersman, 1985). Two studies used the Nursing Child Assessment Satellite Training Program's feeding or teaching scales (Barnard, 1979). An additional five studies each used only one instrument: the Maternal Attachment Assessment Strategy (Avant, 1982), the Parent/Caregiver Involvement Scale (Farran, Kasari, Comfort, & Jay, 1986), the Parental Acceptance-Rejection Questionnaire (Rohner, 1975), the Parent-Child Observation Guides for Program Planning (Bernstein, Percansky, & Hans, 1987), and the Parent Interaction Scale (Heermann & Jones, 1994). One study developed an observation rating system to assess maternal interaction (Crockenberg, 1987), in addition to rating scales developed by Ainsworth, Bell, and Stayton (1974).

Combination of Significance Levels and Effect Sizes

Three general analytic questions are addressed in a meta-analysis: those of central tendency, variability, and prediction. First, the typical study outcome is identified. Specifically, one asks, what is the combined level of significance, and what is the mean magnitude of effect (Mullen, 1989)? The relevant statistics that are derived for each hypothesis test and which are required to perform subsequent computations for significance levels and effect sizes are presented in Table 2. These include (a) the original statistic used in the study to determine the relationship between social support and maternal interaction (statistic); (b) the degrees of freedom (df); (c) the sample size of each study (N); (d) the direction of effect (DOE), which either confirms or does not confirm (+ or -) the positive relationship between social support and maternal interaction; (e) the Z or p values commonly used to determine the significance level of the study outcomes; (f) the r , Fisher's Z , and d values, which are the common units used to determine the effect size; and (g) the quality score, which provides the estimate of the quality of each study.

This meta-analysis was used to estimate the probability that the p values of the 13 studies included might have been obtained if the null hypothesis were true. Table 3 summarizes the general combinations and comparisons of significance levels and effect sizes. These combinations were calculated in three ways: unweighted, weighted by sample size, and weighted by quality index score. From each study's statistical test of the hypothesis, a Z is obtained and multiplied by a weight, w . Where $w = 1$, this produces an unweighted method of combining probabilities. This means that with an unweighted combination of significance levels, each

TABLE 2***Hypothesis Tests Included in Meta-Analysis for Relationship Between Social Support and Maternal Interaction***

Study	Statistic	df	N	DOE	Z	p	Fisher's Z	r	r ²	d	Quality
1. Unger & Wandersman (1985)	$r = .34$	33	35	+	1.20	.05	.35	.34	0.12	0.72	21
2. Unger & Wandersman (1985)	$r = .34$	85	87	+	3.22	.01	.35	.34	0.12	0.72	22
3. Colletta (1981)	$r = .40$	48	50	+	2.88	.01	.42	.40	0.16	0.87	23
4. Schilmoeller et al. (1991)	$r = .19$	17	19	+	0.779	.05	.19	.19	0.04	0.39	21
5. Parsons & Pierce (1998)	$r = .26$	35	37	+	1.55	.28	.26	.26	0.07	0.54	20
6. Voight et al. (1996)	$r = .22$	23	25	+	1.06	.28	.22	.22	0.05	0.45	23
7. Luster et al. (1996)	$r = .22$.81	83	+	2.0	.28	.22	.22	0.05	0.45	26
8. Dormire et al. (1989)	$r = .58$	16	18	+	2.52	.03	.66	.58	0.34	1.4	21
9. Crockenberg (1987)	$r = .32$	75	77	+	2.84	.025	.33	.32	0.10	0.68	25
10. Penny et al. (1993)	$p = .0084$	71	73	+	2.39	.01	.29	.28	0.08	0.58	19
11. Bloom (1998)	$r = .21$	77	79	+	1.85	.05	.21	.21	0.04	0.42	24
12. Reis & Herz (1987)	$r = .22$	175	177	+	2.94	.05	.22	.22	0.05	0.45	25
13. Jensen (1997)	$r = .27$	61	63	+	2.14	.05	.27	.27	0.07	0.56	25

Note. DOE = direction of effect.

TABLE 3***Effect of Social Support on Maternal Interactions***

Social Support and Maternal Interaction	Combination of Significance Levels		Combination of Effect Sizes (M)			
	Z for Combination	Associated One-Tailed p	Fisher's Z	r	r ²	d
Unweighted	7.79	1.67E-14	.31	.30	9.0	.63
Weighted by sample size	7.90	8.30E-15	.29	.28	7.8	.58
Weighted by quality	8.36	3.66E-16	.31	.30	9.0	.63
Diffuse comparison of significance levels	$\chi^2(13) = 6.33, p = .90$					
Diffuse comparison of effect sizes	$\chi^2(13) = 5.22, p = .95$					

hypothesis test contributes an equal amount to the combination of significance levels (Mullen, 1989). The variation in studies can result in unequal weighting, with some studies contributing more than others to the combination of effect sizes. For this meta-analysis, sample size and the quality index were used to weigh the studies equally to better capture the pattern of results. When these three ways of calculating combinations were compared, the effect size was largest when unweighted and smallest when weighted by sample size. Cohen's (1988) operational definitions for effect sizes were used to interpret the results: small ($r = .10$), medium ($r = .30$), and large ($r = .50$). Cohen's d also can be used as the effect size indicator, with $d = .2, .5$, and $.8$ as small, medium, and large, respectively.

A medium correlation was revealed between social support and maternal interaction. The mean r (.30) was slightly higher when unweighted and weighted by quality index than when weighted by sample size (.28). Cohen's d also showed a medium effect size when calculated all three ways (.60).

To interpret the meaning of effect size of the relationship between social support and maternal interaction, a 95% confidence interval was calculated around the average effect size of the r . The confidence interval can indicate the precision of the meta-analysis results (Oxman, 1994). Cooper's (1989) formula for constructing a 95% confidence interval was used and ranged from .239 to .379. A significant relationship between social support and maternal interaction

tion was indicated, because the interval did not contain zero.

To address aspects of variability, Fisher's *Z* transformation is recommended (Mullen, 1989). Although *r* is a useful and accessible index of the magnitude of effect, problems occur in using it for computations, because the unit of *r* becomes nonlinear and the distribution of *r* becomes skewed. In other words, an increase of a certain amount on the scale of *r* will represent different changes in magnitude of effect at different points along the metric. Fisher's *Z* transformation provides a solution to this problem of skewness of distribution of *r* at extreme values (see Table 3).

The extent to which the significance levels and effect sizes varied in meaningful and predictable ways was analyzed in a focused comparison. Theoretically, the age of the adolescent mother and timing of the observed interaction could predict the effect size of social support on maternal interaction. In this meta-analysis, no significant effect size was predicted by any of the hypothesized predictor variables.

To address the problem of poor and varied conceptualization and operationalization of the construct of social support, two subanalyses were performed. Specifically the subanalyses examined whether the sources of support for adolescent mothers, as identified in various studies, produced differing effect sizes. The original 17 studies comprised the sample. See Table 4 for a summary of the general combinations and comparisons of significance levels and effect sizes for these analyses.

The first subanalysis included 10 studies and tested the following null hypothesis: No relationship exists between family as the source of social support and adolescent mothers' interactions with their infants. Family social support included support by the partner and the adolescent's mother. The three ways for calculating effect sizes yielded the largest effect size when weighted

by sample size and the smallest effect size when unweighted. A medium to large correlation ($r = .42$) was revealed between social support by family and maternal interaction, using Cohen's operational definitions. Cohen's *d* showed a large effect size, with *d* ranging from .90 to .96, depending on whether the effect sizes were unweighted or weighted by sample size or quality. The homogeneity test for effect sizes was nonsignificant. No outliers were identified in this subanalysis.

The second subanalysis tested the following null hypothesis: No relationship exists between social support provided through a network of supports and maternal interactions in adolescent mothers. Network social support included support from the composite network of friends and community. Seven studies were included in this subanalysis, and the homogeneity test for effect sizes was nonsignificant. No outliers were identified. A medium-to-large correlation was found between social network support and maternal interaction ($r = .31$ to $.44$), with the smallest effect size calculated weighted by sample size and the largest unweighted. Cohen's *d* ranged from .65 to .97, revealing a medium to large effect size.

Discussion

Although this meta-analysis revealed a medium correlation between social support and maternal interaction in adolescent mothers, no significant effect size was predicted by any of the hypothesized variables. Age, living arrangement, and ethnicity in particular have been identified as important correlates of maternal behavior in adolescent mothers. The sampled studies included either averages or a range for these variables, which was insufficient for yielding any significant predictions. The quality scoring system was developed to provide an index that also was hypothesized to explain some of the

TABLE 4
Family Versus Network Support

Variable	Combination of Significance Levels		Combination of Effect Sizes (M)			
	Z for Combination	Associated One-Tailed p	Fisher's Z	r	r ²	d
Family social support						
Unweighted	6.69	2.00E-11	.43	.41	0.17	0.90
Weighted by sample size	4.48	3.93E-06	.46	.43	0.19	0.96
Weighted by quality	6.54	4.81E-11	.45	.42	0.18	0.92
Network social support						
Unweighted	5.10	1.82E-07	.47	.44	0.19	0.97
Weighted by sample size	4.75	1.06E-06	.32	.31	0.10	0.65
Weighted by quality	5.21	1.00E-07	.44	.41	0.17	0.91

variation in effect size and address the potential bias within studies. The quality index developed for this meta-analysis had several weaknesses. Although some of the criteria used to evaluate study quality had been used in previous research, they were not validated and were based on biased assumptions. For example, first authors who had received a doctorate and published multiple studies were scored higher, as were funded studies and those with experimental designs and matching sampling. Yet valid studies have been carried out by experienced and well-published researchers who were not first authors and did not have funding. Sample sizes of 50 were scored the same as those that had 10, which again put into question the judgment made to determine the quality of a study. Disregarding the issues with the validity of the quality index, the average quality index of the studies included in this meta-analysis was low. Should then the "weaker" studies be excluded or should the overall meta-analysis be discounted? Despite the controversy that surrounds the assessment of the quality of studies, the consensus is that the quality should be evaluated (Jadad, Moher, & Klassen, 1998). In addition, no simple strategy has been agreed upon by experts as to the inclusion or exclusion of weaker studies in the meta-analysis (Sutton et al., 1999). Further research is needed to develop and evaluate rigorous, valid, and simple scales to determine the quality of studies.

Implications for Nursing

The results of this meta-analysis provided quantitative substantiation for the importance of the construct of social support to maternal interaction in adolescent mothers. The findings from the two subanalyses revealed similar effect sizes whether the support was provided by family or through a network. These findings are congruent with the premise and results of Unger and Wandersman's studies (1985), which emphasize that maternal interactions are perhaps more related to the fit between source of support and the context of the adolescent mother's life than either the age of the mother or the timing of the observation of maternal interaction. O'Connor (1994) also found that social support received which specifically related to parenting and met the individual's needs at the time contributed to the adolescent's responsive caregiving, whereas more broadly provided support did not. Adolescent mothers who reported more feelings of conflict within their support network (Jensen, 1997) perceived lower levels of support than mothers who reported no conflict. This also may explain some of the weaknesses in existing models for interventions with high-risk mothers, including adolescents. Preliminary evaluations from the Healthy Families America pilot sites (Daro, 1998) have revealed a lack of consistency in the relationship

between type and frequency of social support provided and program outcomes. A model that allows for individualization of social support interventions that reflect recipient needs and provider-recipient interactions, rather than a prescribed regimen for everyone, may provide the widest possible effect on the maternal interactions of adolescent mothers with their infants.

Finally, this meta-analysis could only summarize a fraction of the studies available because a large number were either missing important data or reported only partial measures of the constructs. In addition, 10 studies included in the meta-analysis reported the use of 13 dif-

A model that allows for individualized social support interventions, rather than a prescribed standard for everyone, may provide the widest possible effect on the interactions of adolescent mothers with their infants.

ferent instruments, many of which had not been validated with adolescent mothers. Few of the measures used to address social support included satisfaction with support or the negative aspects of support or social interactions. Future research with reliable and validated measures that are congruent with the study purpose, population, and conceptualization is needed. Measures that reflect a broader theoretical model of social support can strengthen a construct that for more than 20 years has proven to be an important factor in improving maternal-infant interactions in adolescent mothers.

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